

WHAT IS CLAIMED IS:

1 1. A differential-type dry pipe valve for a fire protection sprinkler system,
2 comprising:
3 a valve body defining an inlet and an outlet, a water-side chamber in communication
4 with said inlet and an air-side chamber in communication with said outlet, and, therebetween,
5 an air valve seat having an air valve axis and a water valve seat having a water valve axis,
6 a clapper mounted to pivot about a pivot axis closely adjacent said air valve seat
7 between a first, clapper-closed position for resisting flow of water through said water valve
8 seat and a second, clapper-open position for permitting flow of water through said water
9 valve seat toward said air-side chamber,
10 an air valve seal mounted for sealing engagement with said air valve seat with said
11 clapper in said first, clapper-closed position, and
12 a water valve seal mounted for sealing engagement with said water valve seat with
13 said clapper in said first, clapper-closed position,
14 said air valve seat being centered a first radial distance from said pivot axis
15 and said water valve seat being spaced a second radial distance from said pivot axis, said first
16 radial distance being greater than said second radial distance.

1 2. The differential-type dry pipe valve of claim 1, wherein said clapper is held in said
2 first, clapper-closed position by air pressure maintained in said air-side chamber and the fire
3 protection sprinkler system, and said clapper is urged from said first, clapper-closed position
4 toward said second, clapper-open position by water pressure from said water-side chamber
5 upon reduction of air pressure in said air-side chamber and the fire protection sprinkler
6 system.

1 3. The differential-type dry pipe valve of claim 2, wherein said reduction of air
2 pressure in said air-side chamber and the fire protection sprinkler system results from
3 opening of one or more fire protection sprinklers of the fire protection sprinkler system.

1 4. The differential-type dry pipe valve for a fire protection sprinkler system of claim
2 1, wherein said air valve seal is mounted to said clapper.

1 5. The differential-type dry pipe valve of claim 1 or 4, wherein said water valve seal
2 is mounted to said clapper.

1 6. The differential-type dry pipe valve of claim 1, further comprising a latch member
2 adapted, in a first latch member position, to permit movement of said clapper from said first,
3 clapper-closed position toward said second, clapper-open position and to resist return
4 movement of said clapper from said second, clapper-open position toward said first, clapper-
5 closed position.

1 7. The differential-type dry pipe valve of claim 6, wherein said latch member is
2 mounted to said body for movement between said first latch member position resisting return
3 movement of said clapper toward said first, clapper-closed position and a second latch
4 member position permitting return movement of said clapper from said second, clapper-open
5 position toward said first, clapper-closed position.

1 8. The differential-type dry pipe valve of claim 7, wherein said latch member
2 comprises an actuator disposed outside said body for movement of said latch member from
3 said first latch member position resisting return movement of said clapper toward said first,
4 clapper-closed position toward said second latch member position permitting return
5 movement of said clapper toward said first, clapper-closed position.

1 9. The differential-type dry pipe valve of claim 1, wherein said air valve seal has a
2 first surface disposed for sealing engagement with said air valve seat and an opposite, second
3 surface exposed for application of sealing pressure to said air valve seal upon said air valve
4 seat.

1 10. The differential-type dry pipe valve of claim 1, wherein said water valve seal has
2 a first surface disposed for sealing engagement with said water valve seat and an opposite,
3 second surface exposed for application of sealing pressure to said water valve seal upon said
4 water valve seat.

11. The differential-type dry pipe valve of claim 1 comprising a single clapper.

12. The differential-type dry pipe valve of claim 1, wherein said clapper, in said first, clapper-closed position, defines an atmospheric region generally between said air valve seat and said water valve seat.

13. The differential-type dry pipe valve of claim 12, wherein said atmospheric region defined by said clapper generally between said air valve seat and said water valve seat is asymmetrical about said air valve axis.

14. The differential-type dry pipe valve of claim 1, wherein said first radial distance is less than about 1.8 times greater than said second radial distance.

15. A differential-type dry pipe valve for a fire protection sprinkler system, comprising:

a valve body defining an inlet and an outlet, a water-side chamber in communication with said inlet and an air-side chamber in communication with said outlet, and, therebetween, an air valve seat having an air valve axis and a water valve seat having a water valve axis,

a clapper mounted to pivot about a pivot axis closely adjacent said air valve seat between a first, clapper-closed position for resisting flow of water through said water valve seat and a second, clapper-open position for permitting flow of water through said water valve seat toward said air-side chamber,

an air valve seal mounted to said clapper for sealing engagement with said air valve seat with said clapper in said first, clapper-closed position, and

a water valve seal mounted to said clapper for sealing engagement with said water valve seat with said clapper in said first, clapper-closed position,

said air valve seat being centered a first radial distance from said pivot axis and said water valve seat being spaced a second radial distance from said pivot axis, said air valve seat and said water valve seat being asymmetrically arranged, with said first radial distance being greater than said second radial distance.

1 16. The differential-type dry pipe valve of claim 15, wherein said first radial distance
2 is less than about 1.8 times greater than said second radial distance.

1 17. A differential-type dry pipe valve for a fire protection sprinkler system having a
2 ratio of effective air sealing area to service water sealing area smaller than a ratio of service
3 water pressure to system air pressure at which the fire protection sprinkler system is actuated.

1 18. A dry pipe valve for a fire protection sprinkler system having a water valve seat
2 and an air valve seat, said water valve seat being off-center relative to said air valve seat.